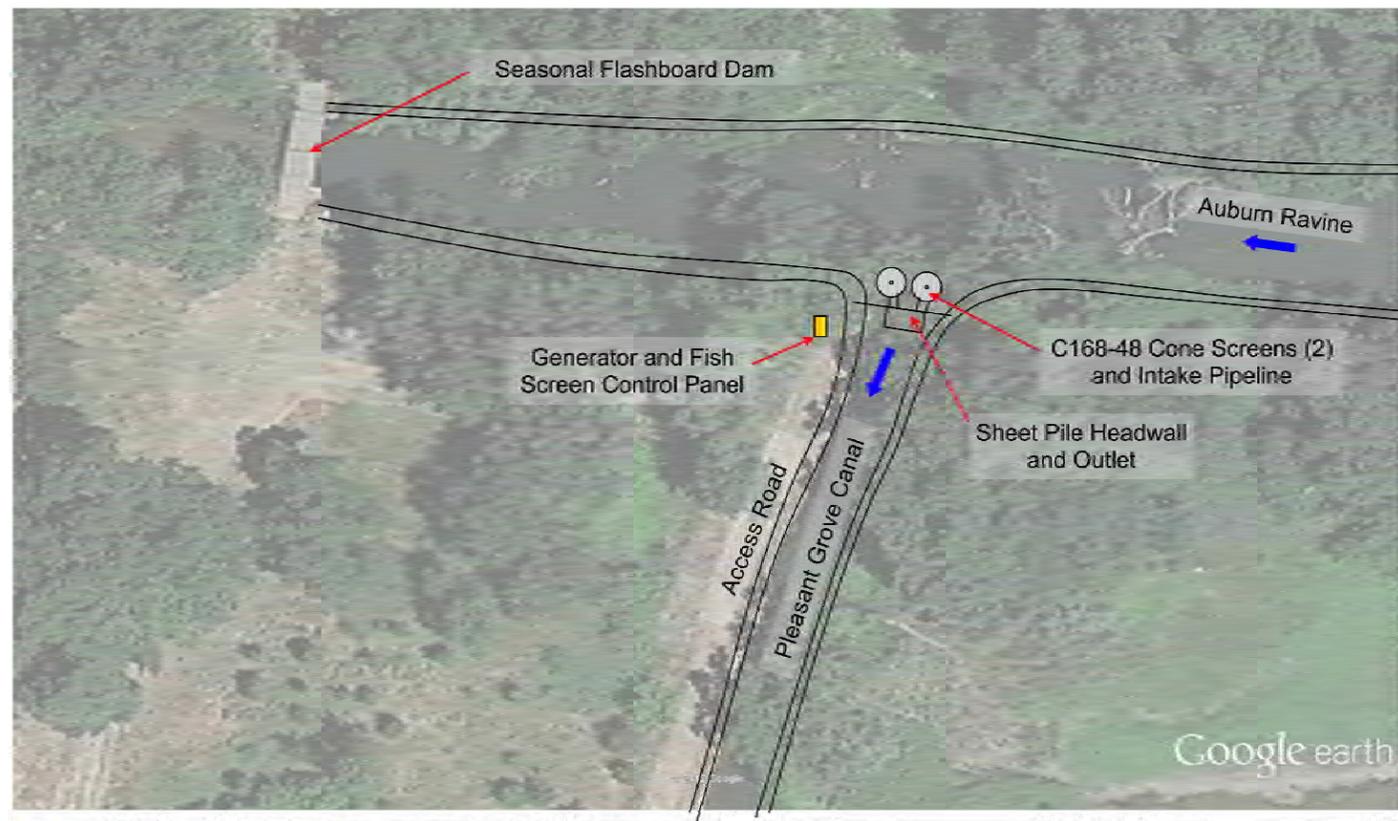


APPENDICES

APPENDIX A
CONSTRUCTION DRAWINGS



Area Map

ALL DIMENSIONS IN INCHES UNLESS NOTED

REV #	DESCRIPTION	DATE	INITIAL

STANDARD TOLERANCES
 Fractional Dimensions ± 1/32
 Decimal Dimensions ± .005

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www.intakescreensinc.com

CA C.L. 796197

ISI Intake Screens, Inc.

8417 River Road - Sacramento, California 95832
 (916) 665-2727 (916) 665-2729 FAX

DATE 10/29/12

APP'D BY DARRYL HAYES

DRAWN BY JACOB CHAPIN

"B" SHEET SCALE NTS

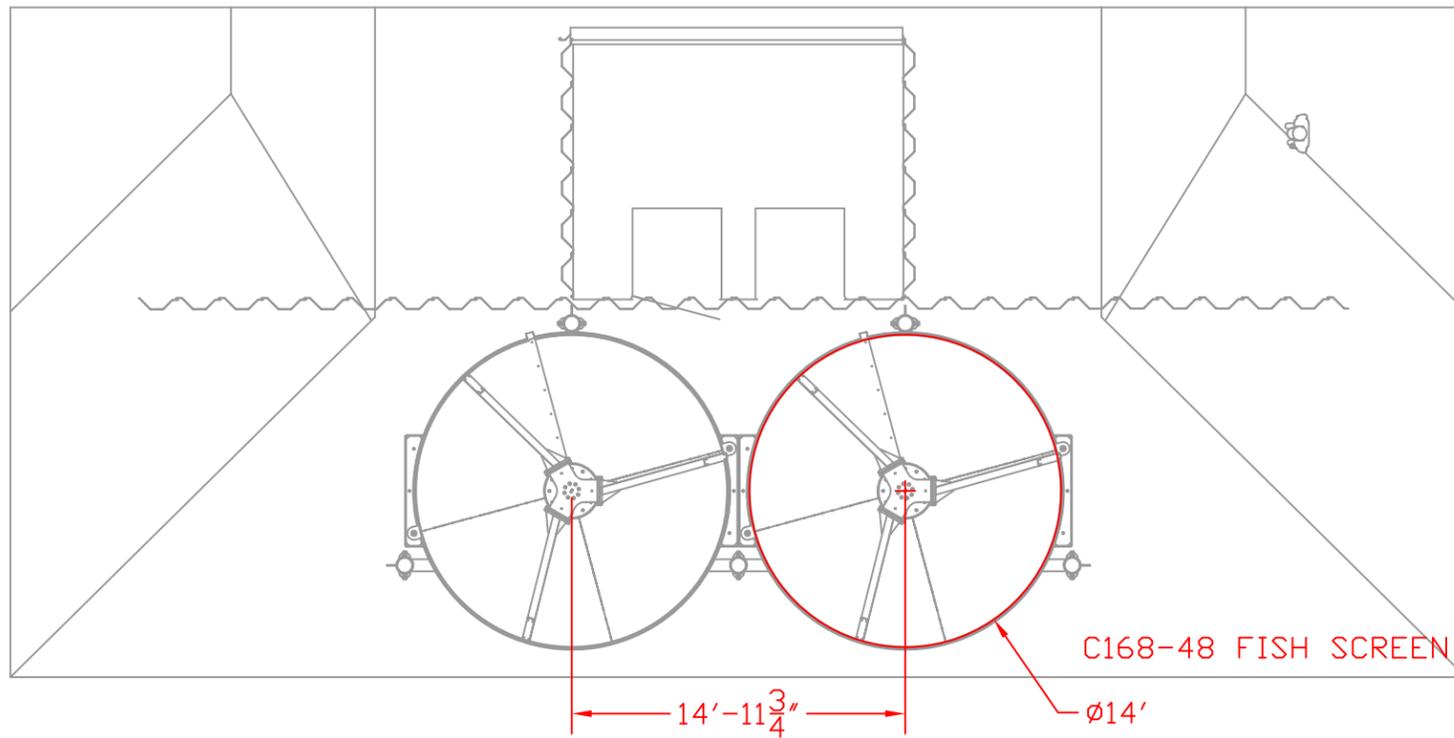
PROJECT: SOUTH SUTTER

DESCRIPTION: LOCATION AND SITE MAP

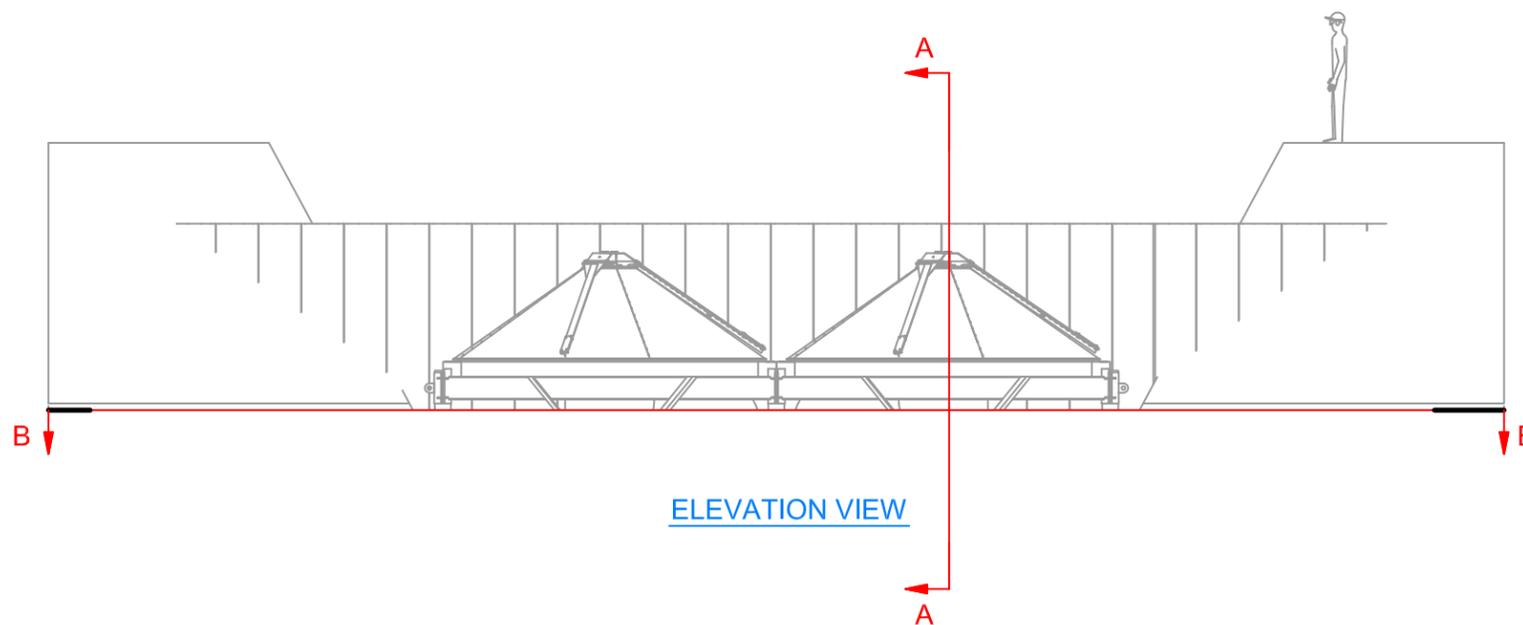
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SHEET NUMBER

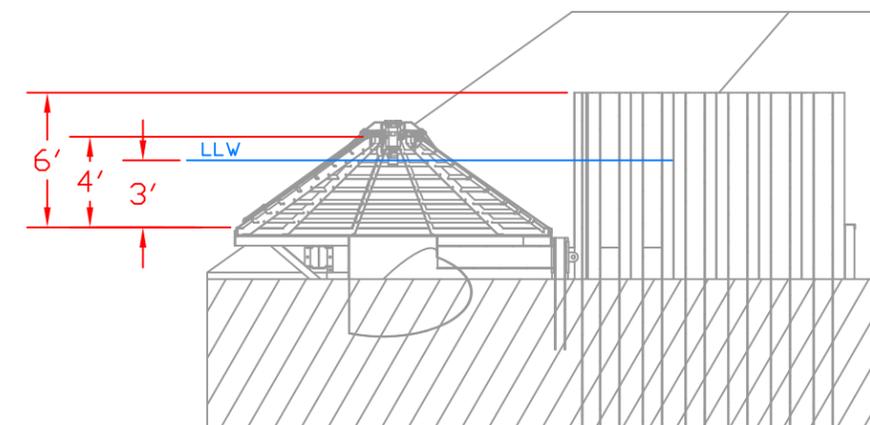
1



PLAN VIEW



ELEVATION VIEW



SECTION A-A

- NOTES:**
- 1) LLW is the minimum water surface elevation when the diversion dam is installed. Minimum water elevation when the dam is removed is at or below the screen base elevation.
 - 2) The proposed site is located in a flood plain. In a flood, the structure may be completely submerged. The controls will be located above the flood elevation.
 - 3) Each screen to be automatically cleaned by a electrical powered hydraulic power unit located on the adjacent bank area..
 - 4) The entire structure to be sited within District right-of-way.
 - 5) No dewatering is necessary for construction since the diversion dam will not be installed. A silt fence will be installed to prevent silt from entering the ravine.

ALL DIMENSIONS IN INCHES UNLESS NOTED			
REV #	DESCRIPTION	DATE	INITIAL

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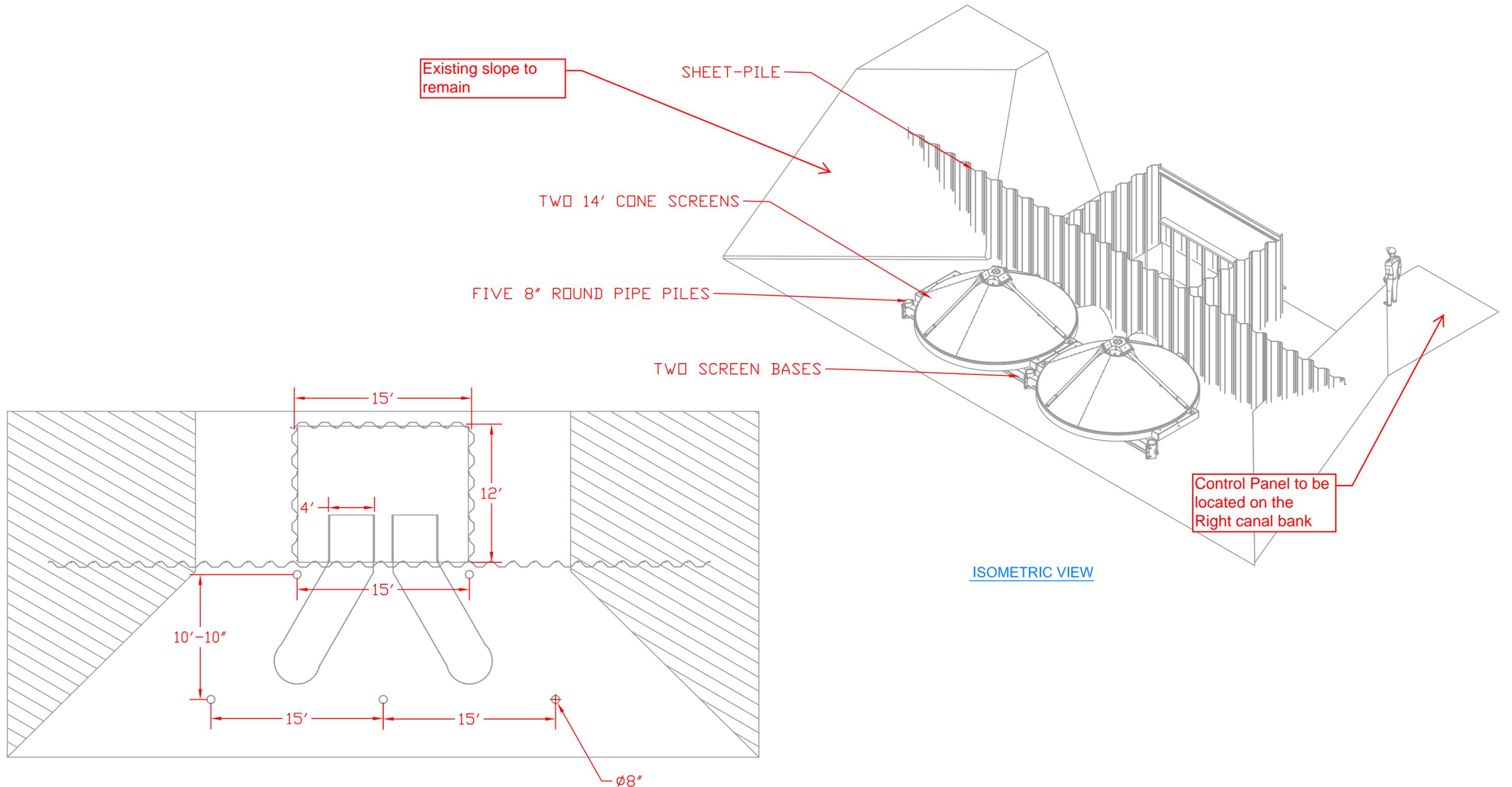
DATE	4/5/12
APP'D BY	DARRYL HAYES
DRAWN BY	JACOB CHAPIN
"B" SHEET SCALE	1:100

PROJECT:
SOUTH SUTTER

DESCRIPTION:
LAYOUT

DRAWING NUMBER:
SOUTH SUTTER

SHEET NUMBER
2



ALL DIMENSIONS IN INCHES UNLESS NOTED			
REV #	DESCRIPTION	DATE	INITIAL

STANDARD TOLERANCES
 Fractional Dimensions ± 1/32
 Decimal Dimensions ± .005

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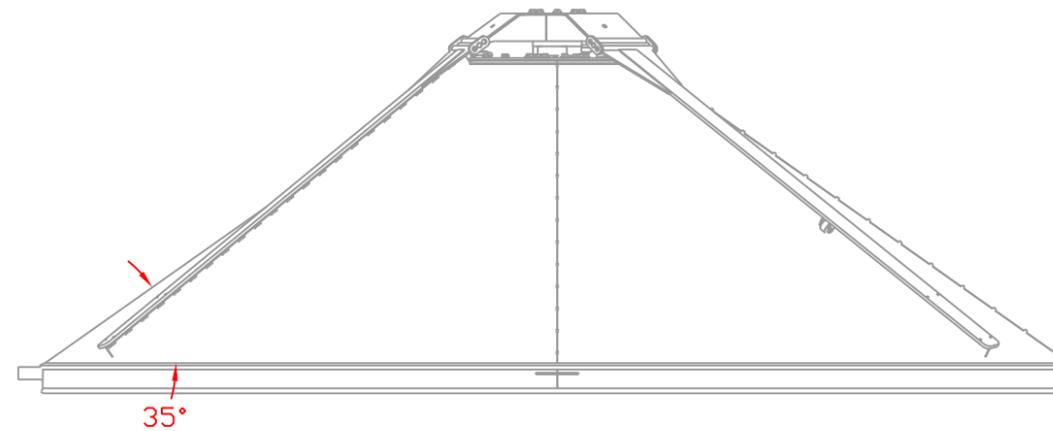
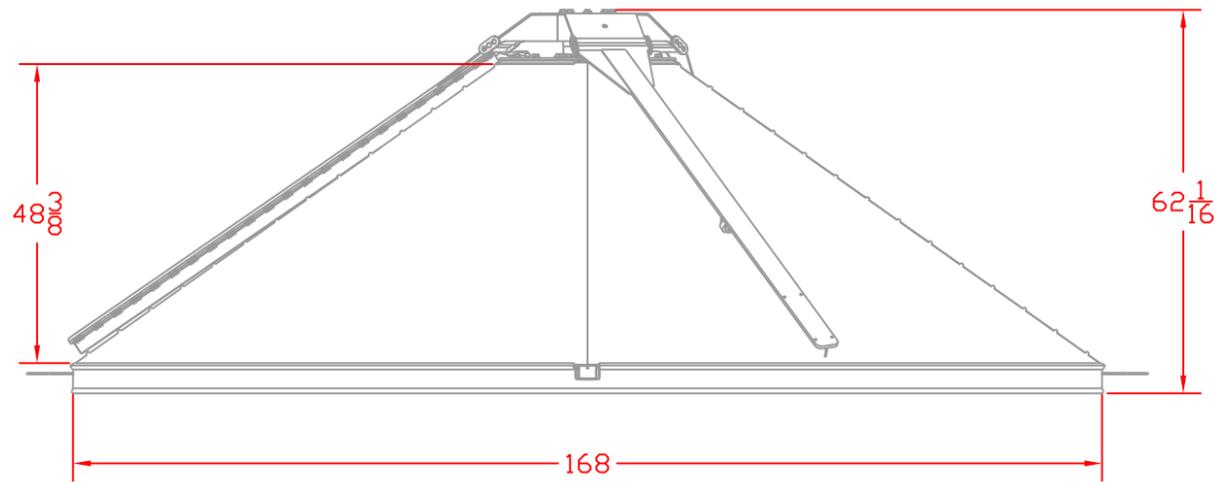
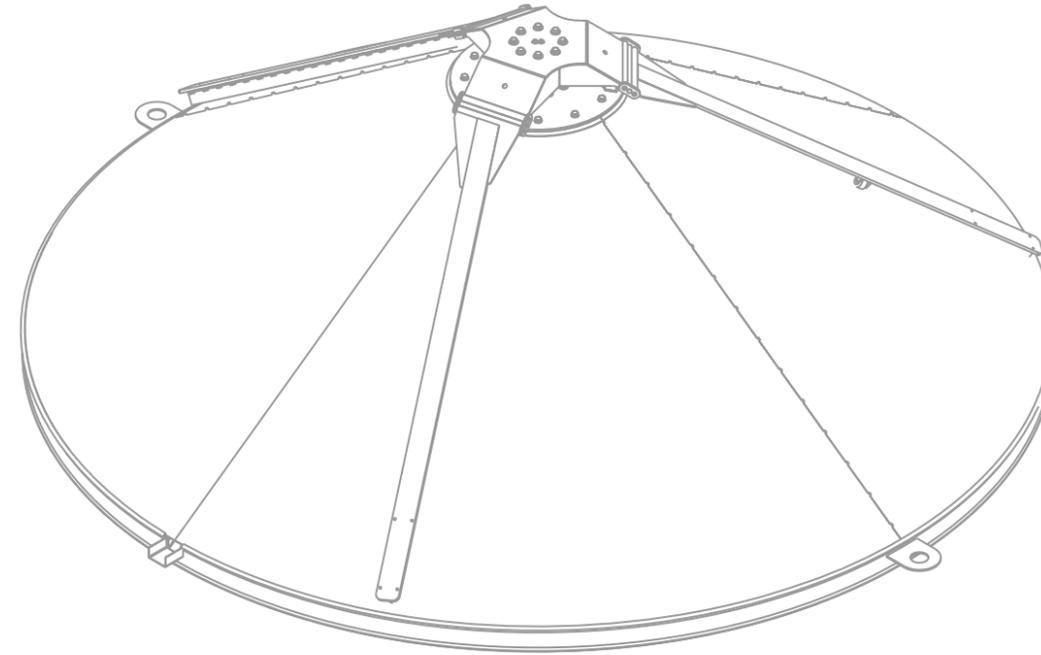
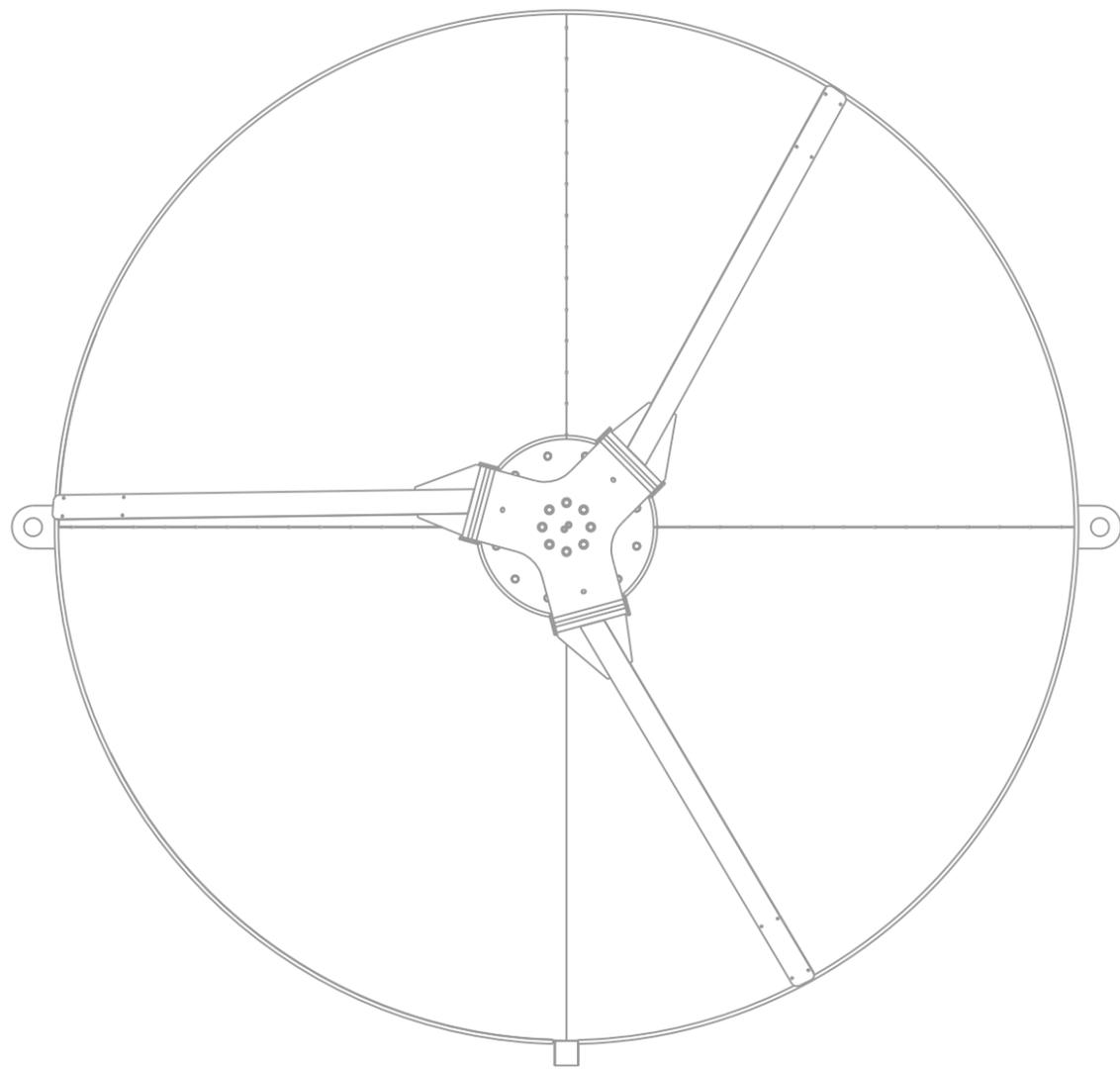
DATE	4/5/12
APP'D BY	DARRYL HAYES
DRAWN BY	JACOB CHAPIN
"B" SHEET SCALE	1:100

PROJECT:	SOUTH SUTTER
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DESCRIPTION:	LAYOUT
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DRAWING NUMBER:	SOUTH SUTTER
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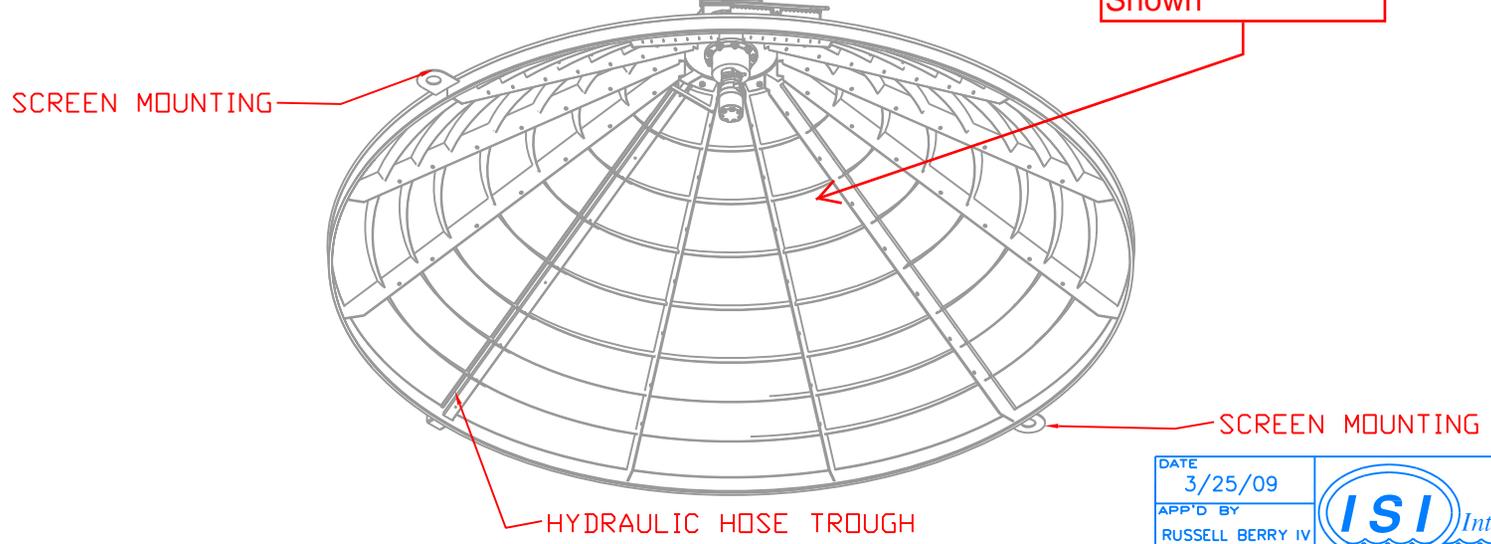
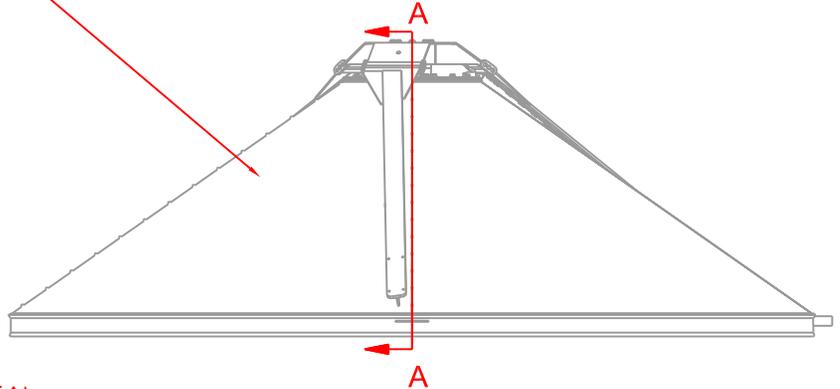
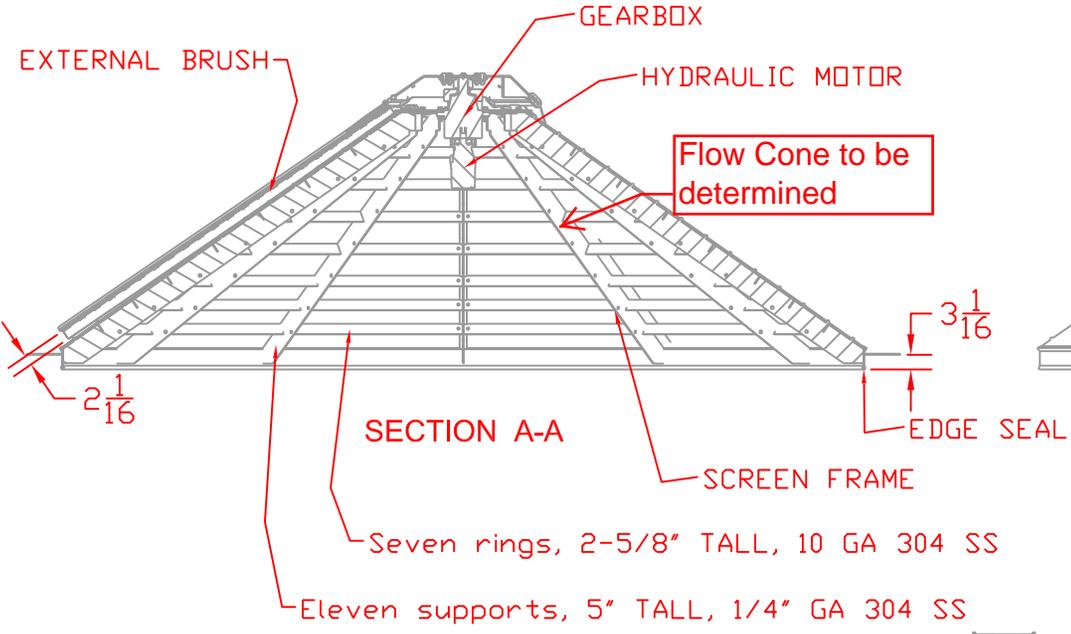
SHEET NUMBER	3
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REVISION #	DESCRIPTION	DATE	INITIAL
...

DATE 3/25/09	 www.intakescreensinc.com 8417 River Road - Sacramento, California 95832 (916) 665-2727 (916) 665-2729 FAX
APP'D BY RUSSELL BERRY IV	
DRAWN BY CHAPIN	MODEL No. C168-48
"A" SHEET SCALE 1:32	DRAWING NUMBER: ISI-14FT-D
DESCRIPTION C168-48 South Sutter Water District	

WEDGE-WIRE SCREEN SURFACE, 180 SQ FT
 HENDRICK 69V WIRE, 50% OPEN AREA, 304 SS
 0.068" QIEW, 0.068 SLOT
 L130Q SUPPORTS, 1" CENTER, 0.118 WIDE, 0.197" HIGH



Flow Distribution
 Cone is NOT
 Shown

Designs are property of INTAKE SCREENS INC;
 and are subject to change without notice.

REVISION #	DESCRIPTION	DATE	INITIAL
...
...
...

DATE 3/25/09	 <small>8417 River Road - Sacramento, California 95832 (916) 665-2727 (916) 665-2729 FAX</small>
APP'D BY RUSSELL BERRY IV	
DRAWN BY CHAPIN	MODEL No. C168-48
"A" SHEET SCALE 1:32	DRAWING NUMBER: ISI-14FT-D
DESCRIPTION C168-48 SSWD	



PGE Meter location and new pole location. Start District supplied conduit and wire from this location

Control Cabinet and power disconnect

Total length of conduit is 400 feet long

Pullbox - locate along access road

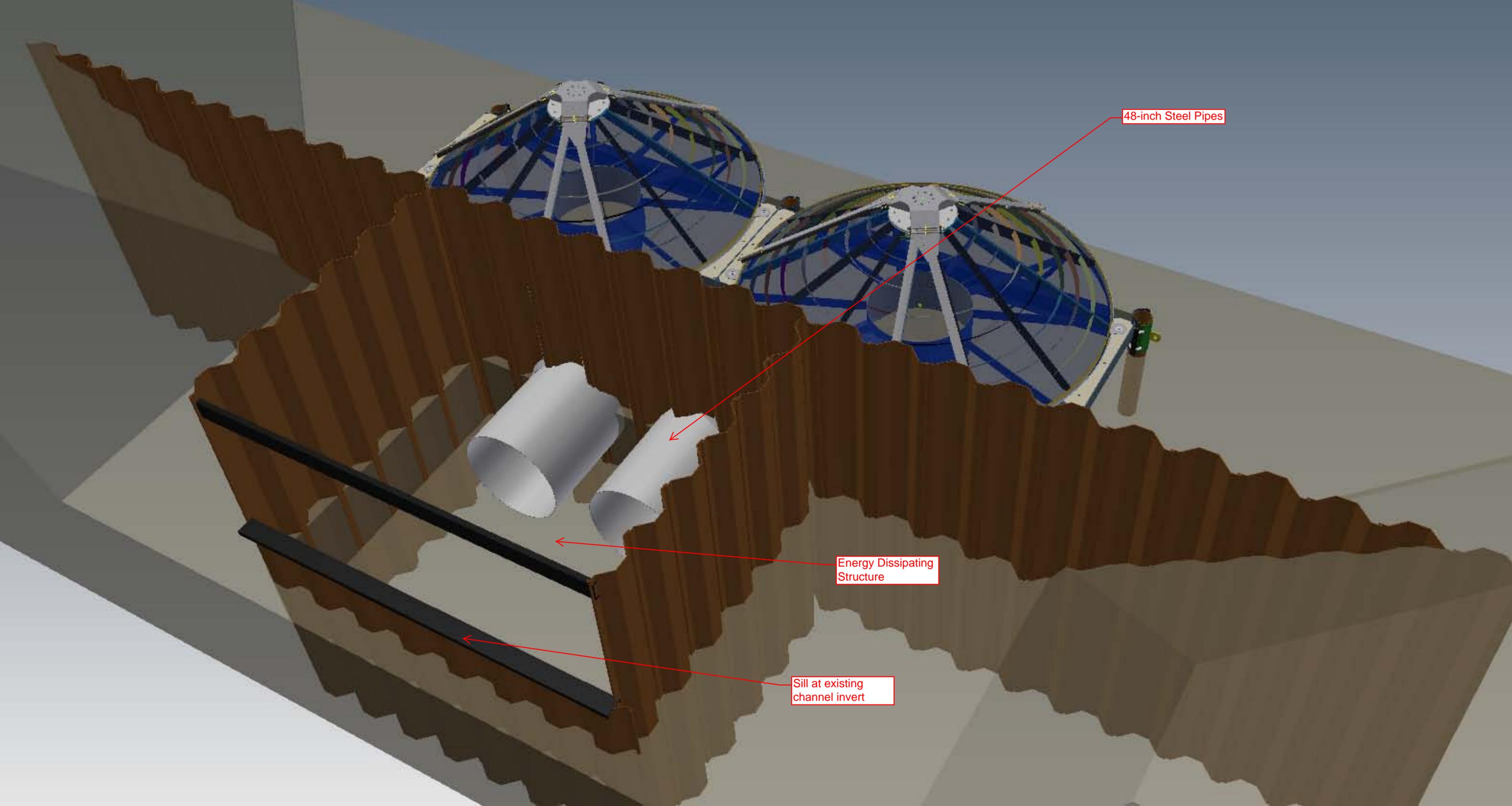
PGE Supplied Overhead Power Line (208 VAC 1 Phase)

© 2014 Google

Google earth

1993

Imagery Date: 8/13/2013 38°51'27.73" N 121°23'11.63" W elev 89 ft eye alt 536 ft



48-inch Steel Pipes

Energy Dissipating Structure

Sill at existing channel invert

APPENDIX B
NOISE ANALYSIS

**South Sutter Water District (SSWD) Fish Screen Project
Intake Screens, Inc.
Environmental Analysis of Pile Driving Impacts on Fishery Resources
Generalized for Typical Cone Fish Screen Project Installation
(Analysis is based on utilizing standard 12-inch steel pilings)**

Project Location:

The Pleasant Grove Canal is located approximately 5.4 miles west of the City of Lincoln in southwest Placer County off of Auburn Ravine. The project site is located on Section 26, Township 12 North, Range 5 East, of the Pleasant Grove U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (quad), Mount Diablo Baseline and Meridian. The centroid of the project site is 38°51'29" North and 121°23'10" West.

Existing Site Information:

SSWD operates a flashboard dam and gravity diversion on Auburn Ravine for agricultural purposes. The canal diverts up to 80 cfs from the impounded water that is typically about 3 feet to 4 feet deep at the canal entrance. There is no canal entrance structure at the head of the canal and all water flow and elevations are controlled at both the flashboard structure on Auburn Ravine and a canal check structure about 1,500 feet downstream of the canal. The flashboard dam is generally installed in April of each year and removed by mid-October to coincide with the irrigation season. The dam installation and regulation is necessary for the canal to operate.

During the winter months when the dam is removed, the canal invert is generally above the river surface elevation, except during high flow or flood events. The top of the canal banks are located below the high flow or flood water elevations so access to the site in the winter is not always possible. During the irrigation season, flows and water depths in Auburn Ravine are generally regulated so the canal surface elevation is relatively constant.

Access to the site is via a gated private road. The site is also adjacent to a protected vernal pool area and a mitigation bank. The area is riparian and wooded; however, the canal easement and access is free of heavy vegetation. The SSWD maintains an easement on the canal and its banks.

The canal entrance will have to be widened to accommodate the necessary screen area and some bank vegetation and embankment area will need to be excavated. Most of this work can be completed from the existing access road area.

Project Description:

Two, 14-foot diameter, cone shaped fish screens with self-cleaning brush cleaners will be placed at the existing intake canal entrance. Each screen will be placed on a 15-foot by 15-foot pile-supported steel base and connected to a 4-foot diameter culvert pipe to convey the screened water into the canal. A sheetpile headwall driven across the canal entrance will separate the canal from the Auburn Ravine. The two culvert pipes from the screens will pass through this sheetpile wall and discharge as shown on the plans. The screened pipes will discharge into a common outfall area behind the sheetpile wall to dissipate the pipe velocity before flowing into the unlined canal ditch.

A minimum area of 240 square feet of screen area must be provided to meet the fish screen velocity criteria of 0.33 feet per second. The two cones will provide about 280 square feet of screen surface when they are located in 2.5 feet of water. If the screen is fully submerged, or in at least 4 feet of water depth, there will be about 360 square feet of surface area available. The base of the screen will be placed just above the current sandy river bottom elevation which is about the current intake channel invert elevation. The large surface area is necessary to reduce headlosses so the canal can achieve its full gravity diversion capability when necessary.

The existing canal entrance will be widened to place the screens as shown on the plans. The river and canal bank slopes will be excavated down to the existing river bed elevation for this. Additional excavations will also be necessary to place the screen bases and pipes. Excavation will occur when the flashboard dam is removed and Auburn Ravine flows are minimal to reduce impacts.

A silt curtain or temporary barrier will be placed at the canal entrance to isolate the canal from the main river during the culvert and screen site installation and prevent turbidity or water quality issues in Auburn Ravine. This barrier will not be designed to prevent seepage or to dewater the canal as the culverts will likely be dug in the wet.

The screen's pile supported bases will be supported by five, eight-inch diameter piles. Each pile will be driven about 15 feet or to refusal. The base will be clamped and bolted to these piles at the proper elevation. The sheetpile headwall will also be driven into the canal bottom about twice as deep as it is tall. A walkway may be provided on top of the sheetpiles for better access to the screen area.

When the screens are installed and operational, screen access will be via the existing embankment road along the intake canal. The screens will be designed to be in-place year round; however, a crane or long reach excavator can be used to remove the screens if desired or if necessary.

The screen's brush cleaning system is operated by a hydraulic power system. A hydraulic power unit will be placed in an outdoor cabinet near the intake site and located above the flood elevation. Hydraulic hoses will be laid in a conduit along access road and to each screen unit.

All design work will be reviewed and approved by MBK Engineers. The screens, bases, sheetpile walls and other features will be designed for the expected river loads, erosive forces, and possible debris impacts.

Description of Piles and Pile Driving Activities:

ISI typically drives a number of in-water support pilings for the installation of fish screens on various diversions located within the Sacramento-San Joaquin River systems, tributaries and Delta region.

Pile driving activities normally occur between August 1 and October 15. ISI typically is able to drive between six (6) and ten (10) piles per day from a land-based crane utilizing 6-inch to 12-inch Standard Schedule 40 steel pipe pilings, with pile penetrations expected up to 40 feet below the existing ground surface. All pilings are normally driven in less than 10-feet of water and into a silt and stiff clay river bottom material.

Pile Driver Information:

ISI will be utilizing an APE Model 64X Vibratory Extractor pile driver for installation of pilings on 2014 fish screen projects (see attached driver specifications).

Vibratory hammers use oscillatory hammers that vibrate the pile, causing the sediment surrounding the pile to liquefy and allow pile penetration. Peak sound pressure levels for vibratory hammers can exceed 180 dB; however, the sound from these types of hammers rises relatively slowly. The vibratory hammer produces sound energy that is spread out over time and is generally 10 to 20 dB lower than impact pile driving.

Vibratory hammers can be feasible and utilized for pile installation, but it is typical that piles need to be proofed (i.e., tested for bearing capacity and structural integrity) with an impact pile driver. The project engineer may find it necessary to proof pilings using an impact type pile driver, but past experience has shown it has not been needed.

Noise Criteria:

Noise criteria is based on utilization of standard 12-inch steel piles. NMFS approved criteria for injury to fish from pile driving activities are 206dB peak and 187dB accumulated SEL for all fish greater than 2 grams. These criteria were developed based on scientific evaluation and are considered to be very conservative (Popper, et al. 2006 – referenced in Caltrans 2009). For example, assumption number four in Appendix A of Popper, et al. (2006) states that the SEL criterion is based on exposure of fish weighing 0.01g. Furthermore, data from Hasting and Popper (2005) suggest that the “no injury” level for 0.01g occurs at 193dB SEL (referenced in Caltrans 2009).

The Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish (Caltrans 2009) summarizes anticipated unattenuated sound pressures for in-water pile driving using vibratory hammers. Based on the type of pile to be used for installation and the shallow site conditions (12-inch steel pipe pile), the peak and accumulated sound pressures are anticipated to be:

Vibratory hammer: 192dB peak and 177dB accumulated

The anticipated peak and accumulated sound pressure levels are below the threshold to injure fish (Table 1):

Table 1. Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities		
	Peak (<2g/60mm)	Accumulated (<2g/60mm)
Interim Criteria for Injury ¹	206 dB	187 dB - for fish size of two grams or greater. 183 dB 0 for fish of less than two grams*
Anticipated Vibratory Hammer (12" Steel Pipe) ²	192 dB	177 dB
Source: ¹ Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities. June 12, 2008 (attached). ² Caltrans 2009.		

Piles less than Standard 12-inch diameter are significantly less than the values shown above and many of the fish screen projects will be using smaller piles, such as 8-inch, if applicable to the project.

Impact Assessment

Pile Driving Effects on Potential Prey (Fish): Construction activities will produce both pulsed (i.e., impact pile driving) and continuous (i.e., vibratory pile driving) sounds. Fish react to sounds which are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005, 2009) identified several studies that suggest fish may relocate to avoid certain areas of noise energy (Caltrans 2009). Additional studies have documented effects of pile driving (or other types of continuous sounds) on fish, although several are based on studies in support of large, multiyear bridge construction projects (Scholik and Yan 2001, 2002; Govoni et al. 2003; Hawkins 2005; Hastings 1990, 2007; Popper et al. 2006; Popper and Hastings 2009 – referenced in Caltrans 2009). Sound pulses (SPLs) at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Chapman and Hawkins 1969; Pearson et al. 1992; Skalski et al. 1992 – referenced in Caltrans 2009). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (CALTRANS 2001; Longmuir and Lively 2001 – referenced in Caltrans 2009). The most likely impact to fish from pile driving activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated.

Pile Driving Effects on Potential Foraging Habitat: In addition, the area likely impacted by the pile driving associated with fish screen installation is relatively small. Potentially a maximum of 1.82 m (19.6 ft) (based on a 60 in [1.5 m] diameter pile) of species foraging habitat may have decreased foraging value as each pile is driven. Avoidance by potential prey (i.e., fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated.

Measures to Further Reduce Potential Impacts to Fish

Soft Start: The use of a soft-start procedure is believed to provide additional protection to fish species by warning, or providing fish species a chance to leave the area prior to the hammer operating at full capacity. The pile driving engineer will utilize soft-start techniques (ramp-up and dry fire) recommended by NMFS for impact and vibratory pile driving. The soft-start requires contractors to initiate noise from vibratory hammers for fifteen seconds at reduced energy followed by a one minute waiting period. This procedure will be repeated two additional times.

Daylight Construction: Pile driving will only be conducted between two hours post-sunrise through two hours prior to sunset (civil twilight), between the periods of August 1 to October 15. Should fish species be detected during pile driving, all pile driving activities will be ceased until fish exit project area.



APE Model 64X Vibratory Driver Extractor Specifications

The Worlds Largest Provider of
Foundation Construction Equipment



SPECIFICATIONS	DATA
Eccentric Moment	781 in-lbs (9.00 kgm)
Drive Force	59 tons (525 kN)
Frequency Maximum (VPM)	0 - 2,400 vpm
Max Line Pull	51 tons (454 kN)
Max Bare Hammer Weight	4,650 lbs (2,109 kg)
Throat Width	13.75 in (35 cm)
Length	70.00 in (178 cm)
Height w/o Clamp	42.50 in (108 cm)

APE Model 275 Power Unit

SPECIFICATIONS	DATA
Engine Type	Caterpillar C7 Tier III
Horse Power	275 HP (202 kW)
Drive Pressure	0 - 4,800 psi (331 bar)
Drive Flow	85 gpm (322 lpm)
Clamp Pressure	Consult Factory
Clamp Flow	Consult Factory
Speed	Consult Factory
Weight	11,000 lbs (4,990 kg)
Length	117 in (296 cm)
Width	59 in (149 cm)
Height	84 in (212 cm)
Hydraulic Reservoir	Consult Factory
Fuel Capacity	Consult Factory



Corporate Offices
7032 South 196th
Kent, Washington 98032



<i>NOAA's Fisheries Northwest and Southwest Regions</i>	<i>U.S. Fish and Wildlife Service Regions 1 & 8</i>	<i>California/Washington/ Oregon Departments of Transportation</i>	<i>California Department of Fish and Game</i>	<i>U.S. Federal Highway Administration</i>
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MEMORANDUM

June 12, 2008

From: Fisheries Hydroacoustic Working Group

Subject: Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities

To: Applicable Agency Staff

The signatory agencies, identified below, have agreed in principle to use the attached Interim Criteria for Injury to Fish from Pile Driving Activities. The agreement was concluded at a meeting in Vancouver, Washington on June 10-11, 2008 with key technical and policy staff from the Federal Highway Administration, NOAA Fisheries, U.S. Fish and Wildlife Service, the Departments of Transportation from California, Oregon, and Washington; and national experts on sound propagation activities that affect fish and wildlife species of concern. The agreed upon criteria identify sound pressure levels of 206 dB peak and 187 dB accumulated sound exposure level (SEL) for all listed fish except those that are less than 2 grams. In that case, the criteria for the accumulated SEL will be 183 dB.

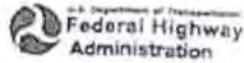
These criteria will apply to all new projects beginning no later than 60 days from the date of this memorandum. During the interim 60 day period, the Transportation Agencies will work with the Services to identify projects currently in the consultation process and reach agreement on which criteria will be used to assess project effects.

The agencies agree to review the science periodically and revise the threshold and cumulative levels as needed to reflect current information. Behavioral impacts to fish and impacts to marine mammals are not addressed in this agreement. Sub-injurious effects will continue to be discussed in future meetings.

The respective agencies also agree to develop appropriate training for staff on these revised criteria, as well as a process to review and possibly refine the criteria, when appropriate.

For questions or concerns about the revised criteria, we recommend staff contact their agency environmental coordinator or agency expert on pile driving issues.

Carol S. Adkins



Federal Highway Administration*

*FHWA supports the use of these interim criteria in the states signing this agreement in principle. FHWA leaves the schedule for implementation to the discretion of the state DOTs in cooperation with their respective FHWA Division Offices and the Services.

Michael Jehan



NOAA Fisheries - NWR

Russell M. Strook



NOAA Fisheries - SWR

Ken S. Berg



US Fish and Wildlife Service Region 1

Michael E. Pagano



US Fish and Wildlife Service Region 8

[Signature]
California Department of Transportation



[Signature]
California Department of Fish and Game



[Signature]
Oregon Department of Transportation



**FHWG Agreement in Principle
Technical/Policy Meeting Vancouver, WA
June, 11 2008**

Interim Criteria for Injury	Agreement in Principle
Peak	206 dB (for all size of fish)
Cumulative SEL	187 dB - for fish size of two grams or greater. 183 dB - for fish size of less than two grams.*

**see Table—to be developed*